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ABSTRACT

This monograph describes a variety of approaches to understanding how cost and quality are related and offers analytical tools. The analyses focus on the direct cost of instruction for a course, a course of study, or an academic program and do not include related support services such as the library or academic computing. Following an introductory part 1, part 2, "Developing the Tools," focuses on choosing the unit of analysis, and framing the study of quality and cost. Part 3, "Financial Modeling of the Curriculum," describes a variety of questions that might be asked and then shows the mathematical model resulting from the analysis of relevant data. Part 4, "Strategies for Implementing the Tools," considers factors that inhibit academic management and the need for collaboration to achieve new approaches to academic management. Appendixes contain discussions of data sources required to analyze academic productivity and Web site data sources and information. (Contains 9 tables and 16 references.) (SLD)

Investing in Quality

Tools for Improving Curricular Efficiency

Ann S. Ferren and Rick Slavings

Association of American Colleges and Universities

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THE ASSOCIATION OF AMERICAN COLLEGES AND UNIVERSITIES
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FOREWORD

AAC&U commissioned Ann Ferren and Rick Slavings to write this groundbreaking monograph, because we want to bring their creative ideas about educational quality and college costs to a larger audience. This work builds on Ferren's work (1996) on the efficiency of the undergraduate curriculum, especially her typology of the managed curriculum, discretionary curriculum, and transformed curriculum. It goes beyond that earlier conceptual work by developing specific financial models, assembling the data sources that provide empirical bases for the analyses, and testing selected reallocations of budgets to produce better educational results.

Ferren and Slavings provide evidence to support basic assumptions about resource management that are shared by AAC&U in our new work in the area of leadership and finance. For example, Ferren and Slavings demonstrate that:

- increasing academic quality is not solely dependent on additional financial resources;
- financial resources are locked up in the curriculum, and they can be identified and reallocated to more effectively support student learning;
- ways exist to create higher levels of learning, sometimes with the same amount of funding, thereby increasing learning productivity;
- campuses have many more options about how to deploy their financial resources than is usually realized; and
- significant improvements to increase quality and constrain cost require new forms of collaboration between the faculty, academic administrators, and business officers.

Together, these items form a powerful message for academic leaders.

Ferren and Slavings go further. They provide practical ideas about how to compile the data on which the analyses depend and offer guidance about conducting the process of addressing on campuses the twin agendas of increasing student learning and containing costs. Some of the issues dealt with in this volume can be contentious and emotion-laden, and the authors provide guidance about how academic leaders might pick their way through this minefield.

The authors have presented their ideas in a number of forums, and the responses of academic leaders have confirmed this is an important area for investigation. Faculty leaders have expressed amazement about the dollars that are involved in traditional academic practices and are willing to explore alternatives. Academic administrators have found enough slack in the system that is the equivalent of a meaningful grant to fund some of their favored educational improvements. And finance officers have been impressed with what faculty members and academic administrators can do with simple reallocations to improve the quality of education.

We are grateful to the W. K. Kellogg Foundation for graciously providing the financial support for AAC&U's initiative in developing collaborative leadership among those with fiscal responsibility who are involved in academic renewal. *Investing in Quality* is a lasting product of the various facets of that initiative.

AAC&U is pleased to make this work available to the academic community, and we hope that it will stimulate the creativity of others about steps they can take to increase student learning while containing the costs of education.

Jerry G. Gaff
Vice President for Education and Institutional Renewal
Association of American Colleges and Universities

ACKNOWLEDGMENTS

This project was begun at the invitation of Jerry Gaff and benefited from opportunities to present early versions of the work to conferences sponsored by the Association of American Colleges and Universities, the National Association of College and University Business Officers, the Society for College and University Planning, and the Council of Independent Colleges.

Carol Schneider, president of AAC&U; Jerry Gaff, vice president for education and institutional renewal at AAC&U; and Larry Goldstein, executive vice president of NACUBO, raised helpful questions in the final stages of the project.

Our colleagues at Radford University, Martin Aylesworth, assistant to the vice president for academic affairs; Ivan Liss, dean of the College of Arts and Sciences; and Stephen Lerch, associate dean of the College of Arts and Sciences, assured us that the manuscript would pass the campus test and made important observations about how to communicate our message to faculty and campus administrators.

We particularly appreciate the broad audiences at many meetings that let us know through their attendance, e-mail, and phone calls that ours is a worthwhile, although somewhat controversial, perspective.

Ann S. Ferren
Vice President for Academic Affairs
Radford University

Rick Slavings
Assistant Vice President for Planning and Research
Radford University

INTRODUCTION

Quality of instruction and student learning have always been a central focus shaping faculty commitment to curricular change. New economic imperatives, however, require thoughtful reassessment of the resources needed and available to achieve and sustain quality. Despite external and internal pressures to manage costs while increasing access and enhancing quality, colleges and universities have resisted academic restructuring. Public opinion is increasingly unsympathetic to higher education's stance and questions both educational outcomes and the practice of passing on instructional costs to students and families in the form of higher tuition. What had been a campus concern has become a national social-policy issue as state and federal legislators join parents and employers in demanding that they guarantee educational value—high quality at an affordable price.

The Challenge of Cost Containment and Quality Assurance

Over the years, campuses have used a variety of short-term strategies to manage costs, sometimes without full analysis of the impact on the quality of student learning. Typical cost cutting approaches such as deferring maintenance, freezing library expenditures, reducing full-time faculty and staff, and raising class sizes have made little dent in overall instructional costs. In some cases, impatient governing boards and legislators have imposed draconian measures on public institutions such as eliminating programs, limiting faculty salaries, cutting subsidies, and forcing administrative restructuring in order to increase productivity. Market forces and the competition for students have forced private institutions to reallocate instructional dollars to tuition subsidies. These administrative approaches not only impact the services and programs available to students but also fail to address the fundamental question: Can colleges and universities be more productive?

Despite the fact that the curriculum accounts for the greatest instructional expenditure, little sustained attention has been paid to restructuring curriculum and instruction for both efficiency and effectiveness. Focused primarily on personnel costs, campus leaders, both administrators and faculty members, have underestimated the full range of approaches they can use to improve academic productivity in a systematic way.

This monograph describes a variety of approaches to understanding how cost and quality are related and offers analytic tools understandable to those through-

out the campus who need to use them. Other methods that address problems unique to a given campus can be developed using the same research approach and data resources established for the tools described here.

We recognize that many campuses are undertaking this kind of analytic work and others are considering wholly new approaches to higher education. We also recognize the special challenge of rethinking productivity if one wants to maintain education in the traditional form, that is, campus-based, relying on full-time faculty, and offering individual attention to students. Although some visions of higher education in the twenty-first century eliminate the conventions of courses, credits, semesters, faculty workloads, graduation requirements, and geographic location for instruction, the tools presented here assume these current day conventions since most campuses continue to structure curriculum and instruction in this way. The tools do reflect, however, the call for a critical shift from emphasizing faculty productivity alone to focusing on learning productivity, ideas first offered by Bruce Johnstone (1993). Consequently, they link the cost of course offerings and inputs with the cost of student experiences and outcomes. In doing so, the tools shift the focus from how teaching is structured to how the curriculum is structured and how students learn.

THE RESTRUCTURED CURRICULUM

- Focuses on student productivity, NOT faculty productivity
- Defines student learning outcomes
- Identifies essential faculty-student interaction
- Takes advantage of new technologies and peer learning
- Deploys valuable faculty resources in new ways
- Conducts continuous assessment with feedback to students
- Uses proactive curriculum development based on future needs of students

PART 1: GETTING STARTED

To begin a campus conversation on quality, cost, curriculum, and student learning requires significant attention to clarifying terms. Wry observers of higher education often note, "I can't define quality, but I know it when I see it." That may not be so easy. A student recently wrote his president complaining, "There is a lot more teaching than learning going on around here, and you ought to do something about it." At a minimum, campuses must more conscientiously assess both the inputs and outcomes of the curriculum.

UNDERSTANDING THE IMPACT OF COST

Too often discussions of higher education indiscriminately use price and cost as though they were interchangeable terms. The National Commission on the Cost of Higher Education defines "cost" as what an institution spends to provide education and related educational services to students, "price" as the tuition and fees students are charged, and "subsidy" as the financial assistance institutions provide to discount the price (Manno 1998, 24). The analyses in this monograph focus on the direct cost of instruction for a course, a course of study, or an academic program and do not include related support services such as the library or academic computing.

The findings of the National Commission lend urgency to the development and use of measures of productivity. Between 1987 and 1996, during a period of relatively low inflation, the average instructional cost per student rose by 57 percent at public four-year institutions, by 69 percent at independent four-year institutions, and by 52 percent at public two-year institutions. These costs, measured by the Higher Education Price Index, have risen for thirty years and far outpaced the Consumer Price Index (Manno, 24). Strikingly, the price students paid increased at an even faster rate than cost, while the subsidy—the difference between the institutional cost of providing an education (cost per student) and the tuition and fees charged to students (price)—declined as a percentage of total student costs, producing a double bind for students. Continued increases in tuition and reductions in financial aid could clearly have an impact on college participation and set back two decades of increased access. The ripple of consequences would be felt nationally as well as on individual campuses.

Higher education is also challenged to try to serve larger numbers of students, more successfully, with the current resources. Recognized as a widely sought

service similar to health care, education is expected to address a wide variety of social needs including services to benefit the common good, to create responsible citizens, and to develop the economy. Thus, limiting college-going rates and not increasing graduation rates has an impact, not only on individuals in terms of personal income and social competence, but also on society at large. This places the demand for more efficient and effective higher education squarely on the national agenda.

To date, external forces aimed at restructuring to create academic efficiencies, such as restricting staffing levels, capping tuition, and reducing state funding, have been sporadic, limited, and without campus-wide support, primarily because the initiatives are mandated, highly centralized, and insufficiently tailored to individual campus conditions (Archibald and BeVeir 1998). The effect of years of budget reductions, insufficient rationales, increased workloads, and public skepticism has produced pervasive low morale on public campuses. Private campuses are not immune from these effects. Long used to raising tuition to cover rising costs, campus administrators now worry about student debt, losing market share, and charges of elitism. They, too, are seeking cost containment strategies and are rethinking how best to set tuition, fund innovation, maintain enrollments and admissions standards, and improve outcomes.

MEASURING QUALITY

Despite these pressures and with little access to information on institutional costs, many continue to equate increased budgets and the ability to maintain traditional staffing patterns with higher quality. Initial efforts to identify the specific benefits of the current curriculum and modes of instruction to justify increased costs were hampered by limited methods of assessment. Increasingly, serious efforts are being made to measure institutional performance. To achieve continuous improvement and to measure quality require good assessment tools.

Quality indicators may range from "soft" measures such as student satisfaction, engagement with learning, and curricular coherence, to "hard" measures such as graduation rates, exit competencies, and employment statistics. Where assessment once relied on qualitative measures because of considerable faculty resistance to direct measures of learning outcomes, external pressures for hard data have increased the use of statistical measures, quantitative data, and more rigorous analyses of process. Increasingly sophisticated quantitative indicators of the quality of the instructional program are now available and include many process measures such as student effort, instructional climate, classroom behavior, curricular integration, and coverage (Ewell 1997, 623-624).

Data for these quality or effectiveness analyses are drawn from many sources including catalog review, syllabus review, transcript analysis, focus groups, portfolios, and faculty and student reports. Descriptions of the wide variety of both process and outcomes assessment tools are readily available in the literature (see for example, Banta, et. al. 1996), and thus, this monograph gives no attention to these assessment tools. Instead, its purposes are to analyze instructional costs and explore the relationship between resources and results.

UNDERSTANDING THE RELATIONSHIP OF QUALITY AND COST

Despite claims that increases in instructional costs are not producing concomitant increases in quality, there is strong evidence that many investments have increased learning. Throughout the last twenty years, a wide variety of changes and innovations have adapted programs to new needs, new learners, and new locations. Undertaken to extend access and increase learning, these changes include both changes in inputs such as facilities, teaching materials, and technology, as well as changes in processes such as active learning, peer instruction, experiential learning, developmental transition programs, senior capstone seminars, and more. Indeed, our understanding of what increases learning is steadily improving.

WHAT DRIVES UP LEARNING PRODUCTIVITY

- High expectations, clear performance levels
- Regular feedback on learning performance
- Teamwork and group problem solving
- Opportunities for diverse learning approaches
- Hands-on experience and internships
- Time on task and time efficiency
- Carefully sequenced courses and integrated learning experiences

At the same time, analyses of inputs, processes, and outcomes also show that not all innovations or increases in inputs result in improved quality. For example, smaller class sizes alone do not produce increases in course completion nor do higher faculty salaries result in higher retention rates. Linking quantitative assessment approaches used to measure effectiveness with quantitative data on efficiency can determine which drivers of increased instructional costs are beneficial to learning and which are unproductive.

The definitions of efficiency as linked to effectiveness that guide this work are several. Efficiency can be achieved by reducing resources while still generating the same learning outcomes. Efficiency or cost effectiveness can be achieved by maintaining the same resource level while producing greater learning effectiveness. A third option is to actually invest more resources to significantly increase results. The tools in this monograph represent all three approaches, for example, reducing the marginal cost of instruction, maximizing the use of course capacity, and making modest investments in support programs to significantly improve student retention.

The tools all define efficiency in terms of direct instructional cost. A more sophisticated definition, one beyond the scope of this monograph, would not only focus on the level of learning produced by dollars or effort of instructors but also would include effort of students, student time, and opportunity costs related to pace, convenience, and alternative activities. A more sophisticated analysis of effectiveness would go beyond credit hours and graduation rates to include the deeper purposes of education such as intellectual growth, changes in economic status, lifelong learning, and civic engagement.

EXAMPLES OF POSITIVE FACTORS DRIVING UP INSTRUCTIONAL COSTS

- Increased support services (e.g., advisors, career counselors)
- Increased student-faculty interaction
- Facility and technology improvements
- New pedagogy (e.g., active learning, team teaching)

EXAMPLES OF NEGATIVE FACTORS DRIVING UP INSTRUCTIONAL COSTS

- Increased specialization resulting in course proliferation
- Reductions in teaching loads to do research or administration
- Underenrolled classes
- Student failures and withdrawals, course repeats
- Lack of sequence resulting in disjointed curriculum

PART 2: DEVELOPING THE TOOLS

Even without the overriding concerns about the quality and cost of higher education, most academic administrators and faculty leaders yearn for more risk capital, more budget flexibility, and more information to guide their difficult decisions. Whether driven by the need to support a new general education program, find additional release time for faculty research, or self-fund a new program, administrators should find intriguing our assertion that there are resources tied up in the curriculum that can be reallocated. Both faculty and institutional researchers, however, need to be involved in the quest.

CHOOSING THE UNIT OF ANALYSIS

The unit of analysis affects the measures of efficiency and the level of decision making. For that reason, an examination of curricular efficiency must begin with defining the unit of analysis. Curriculum may be defined as every course offered, only those courses that form an integrated program of study, or all programs of study in an institution.

If curriculum is defined as every course section offered, then effectiveness means meeting course objectives and monitoring student learning outcomes, and efficiency can be measured in terms of enrollments and cost per student. Past practice using this unit of analysis has focused primarily on how to reduce faculty costs rather than how to increase learning. This monograph goes beyond those analyses of class size and substitution of lower cost labor and looks also at course passing rates, the costs of failures and reenrollments, and alternative delivery systems.

If curriculum is defined as an integrated course of study such as general education or a major, then effectiveness can be measured in terms of progress toward the degree and meeting career aspirations, and efficiency can be measured in terms of cost per student for completion. A typical recommendation on many campuses is to eliminate small enrollment courses and cut programs with a small number of majors. This monograph suggests as alternatives the importance of reviewing programs with a focus on frequency of course offerings, course proliferation, student success in upper-level courses, and per-student program costs compared to benchmark schools.

If curriculum is defined as the overall offerings of the institution, all programs of study, then effectiveness can be measured by student satisfaction, alumni success, academic reputation of the programs, and public confidence in the institution,

and efficiency can be measured in terms of four-, five-, and six-year graduation rates, a typical concern of campuses. This monograph takes a more detailed look at this issue and focuses as well on retention and credit hours completed for the degree.

The unit of analysis is particularly important for the decision-making process that follows the analysis, as each member of the higher education community has a different perspective and stake in curriculum development and continuous improvement. A majority of faculty seldom, if ever, think about the cost of the curriculum or whether the many autonomous decisions that have developed the course offerings result in coherence. Typically, individual faculty are primarily interested in the courses they teach, the class size, the regularity of offerings, and the opportunity to develop new courses in their specializations. Most department chairs are concerned about the attractiveness of their programs to majors, the trends in FTEs, and the ability to staff courses. There is little time to challenge assumptions such as "If the course is in the catalog, it should be taught" and "Specialization and increased differentiation are evidence of quality." Although given authority over the curriculum by tradition, faculty members and department chairs are rarely charged with managing it efficiently. Conventional norms based on autonomy, tenure, disciplines, and departments inevitably inhibit serious rethinking of academic productivity.

Administrators know the difficulty of generating systematic approaches to productivity and understand how clumsy are the centralized efforts to manage curricular resources. Further, they know that a close analysis of any institution's curriculum reveals a variety of hidden agendas—turf protection, political considerations, changes in the disciplines, shifts in student demand, and special interests of key administrators. It takes a campus-wide discussion of the purposes and foundations of the curriculum as well as deliberate approaches to management of the curriculum in order to create a coherent, streamlined, student-oriented, and cost-effective curriculum.

FRAMING THE STUDY OF QUALITY AND COST

Fundamentally, studying curricular productivity is a research task, and thus, each campus must begin its work by asking questions: What do we want to know that will help us make better choices about how to use our resources? If quality is our goal, can we invest our precious dollars more effectively? Intuition and hunches might suggest appropriate questions, but hard data developed by the institutional research office will be necessary to begin to shape the answers.

FACULTY PRODUCTIVITY. Initial work on cost reduction focused on faculty resources. Because the largest portion of the budget consists of salaries, analyzing ways to reduce faculty salaries and to get more work from faculty was a natural place to begin. Researchers and administrators taking this approach believed that if faculty could teach larger classes, or less expensive faculty were used, there would be immediate savings (Brinkman 1989; Paulson 1989; Zemsky 1993). That approach looked primarily at a single input variable and its cost—faculty salaries. Although an interesting area of study, faculty are a relatively inflexible resource and thus, downsizing, cross training, or replacement—options in many industries undergoing restructuring—are blocked by specialization in training and tenure practices. Furthermore, national studies of full-time faculty (Yuker 1984) reveal an average work week of about fifty-five hours, suggesting that faculty are fully utilized. While it would not be appropriate to totally discount the importance of examining faculty costs, a narrow focus on faculty workload has limitations. More interesting and useful questions and analytic tools are related to student success, the structure of the curriculum, and institutional policies. These topics are the major focus of this volume.

STUDENT SUCCESS AND LEARNING PRODUCTIVITY. Although participation in postsecondary education has increased considerably in the last two decades, the percentage of those who finish has not increased, and for those finishing, it is taking longer. Since students continue to be vulnerable in making the transition to college, efforts to reduce the freshman attrition rate can bring a significant return to the campus on the revenue side in the form of increased tuition revenue. To increase retention, campuses provide support services to help underprepared students achieve success. Small investments in advising, study skills programs, mentoring, and the like can bring large returns. In these cases investing in learning increases efficiency and effectiveness.

The greatest waste of resources, both human and financial, is in the number of students failing, withdrawing, or repeating courses. Research on course failures and withdrawals shows they have nearly doubled since the 1970s, with the increase heavily concentrated in remedial courses and in mathematics below the level of calculus (Adelman 1999, viii). The average time to completion of degree is almost five years, and the average number of semester credit hours completed has increased 4.5 percent from 129 to 135, despite many state mandates to reduce credit hour requirements to 120 (Adelman 1999, viii). When students complete

one semester of work or more than they need for the bachelors degree, there is increased cost for both the student and the institution.

A campus wishing to increase efficiency needs to analyze retention, years to complete the degree, remedial course work, and articulation of transfer credits. The extended time to degree, stopping out, and reduced student course loads make it particularly difficult to plan a curriculum for continuous progress and assure that all courses are available so as not to further delay the student. Better advising could reduce the number of students graduating with excessive credit hours. However, the savings in extra teaching costs must be offset by the reduction in tuition revenues and the expense of improved advising.

CURRICULUM MANAGEMENT. A fundamental approach to increasing the efficiency of the curriculum without sacrificing quality is to manage the curriculum so that course offerings match student needs for successful movement through the program (Zemsky 1990; Ferren 1996). To do so requires attention to sequencing, scheduling, and frequency of offerings. Unfortunately, the process through which curriculum is developed and scheduled frequently results in duplication, specialization, inflation of requirements, and many discretionary courses that need not be offered in order for students to complete degrees. The curriculum is usually developed one course at a time or a program at a time, since faculty have the authority to create courses based on disciplinary interests and perceptions of new specialties that should be covered. What and when faculty want to teach does not always match student needs.

On most campuses, more courses are added each year than are removed from the curriculum. Even when a campus has a regulation on removing seldom-offered courses from the catalog, most registrars are uncomfortable enforcing it. College catalogs list thousands of courses; yet, from enrollment studies a campus can determine that 70-80 percent of the course work taken by students is accounted for by about 30 percent of the courses available. The costs associated with this fragmented decision-making process and curricular variation can be significant. A study of any curriculum will find many courses that are not essential to a major, many that are duplicative across disciplines, and many that are not a requirement or prerequisite for another program of study. Managing and restricting the curriculum could redistribute students where there is capacity in the curriculum.

INSTITUTIONAL PRODUCTIVITY. At another level of analysis, the program level, costs of specific educational programs can be compared to those of similar institutions and/or to other programs on the same campus. In the face of departmental claims that they need more resources, vice presidents and deans often feel quite helpless because they have no benchmark other than the previous year's expenditures to compare the cost and results. Academic programs vary widely in cost. Some programs, such as nursing and music, are necessarily expensive, and they must be subsidized by less costly programs. Understanding the degree to which one's institution is able to deliver a program at a cost similar to the same program at other institutions provides guidance for bringing program costs under control or investing more resources in a program.

New opportunities provided by technology offer significant possibilities for teaching programs at multiple sites without increasing expenditures. While the costs of the infrastructure, for example, equipment, technical support, and networking, would need to be factored in to determine actual savings, in many cases these costs are not borne by the institution alone. There are also numerous low-tech options for extending instruction, such as guided study, independent study, and credit for life experience. Cooperative study programs and internships may reduce instructional costs by shifting the "teaching" responsibility to community partners who mentor and supervise students. In each case, evidence can be gathered about the effectiveness of such hands-on learning in relationship to the cost of delivery.

These different approaches to this issue of quality and cost point to various ways of understanding the costs that are involved in conventional practices and of determining "savings" and increased revenues that can be reallocated to other, more educationally powerful, practices.

PART 3: FINANCIAL MODELING OF THE CURRICULUM

In an effort to demonstrate the wide spectrum of approaches to analyzing the curriculum and its costs, this section describes a variety of questions that might be asked and then shows the mathematical model resulting from the analysis of relevant data. For each example in the text, we suggest the assumptions underlying it and the possibilities for its use, as well as limitations of the application. The models use examples from both large and small campuses, and the analyses are appropriate to both public and private institutions. This section clearly demonstrates that campuses have many choices about how to allocate instructional resources.

A few comments about the use of models are appropriate at the outset. First, models cannot account for the many institutional variations in how budget allocations are made at the institutional level, such as responsibility-based budgeting, or the wide variation in authority that academic units have for budget management. Further, the examples cannot reflect the many variations in state funding models such as performance funding or enrollment-based funding. What the examples intend to do is suggest how to identify a relevant research question, model it, and understand the implications of alternative actions based on the model.

A second note about the modeling is that it is not a task that a well-meaning academic administrator or faculty leader can do alone. The skills required to link databases and do the analyses are most likely part of the repertoire of the professionals in the institutional research office. The data and decisions must be far more sophisticated than a clumsy last minute call from the dean's office to cancel any class with less than ten enrolled students based on the registration printout. Those quick fixes ignore the foundation of the curriculum. Moreover, they destroy faculty confidence in the purposes of seeking opportunities for efficiency or reallocation. Thus, we recommend taking time to determine which questions and analyses are useful to a particular campus and what kind of decision-making process is appropriate for the culture of the campus. With such a long-term view, new ideas about alternative ways to teach, opportunities to improve productivity, possibilities for sharing resources, and strategies for linking strategic planning and strategic budgeting can be part of the conversation.

Finally, in each approach described, the central assumption is that campuses have choices about how to use their limited resources. Funds not spent on part-

time faculty can instead be allocated to technology improvements. Funds not spent on reteaching students who failed in their initial taking of a course can be used for laboratory equipment or visiting guest artists. To continue to use resources without any analysis of their impact is ineffective, but, more important, it limits the opportunity to consider alternative investments such as faculty development, equipment, student support services, or many other things that can improve the quality of the instructional program.

In the following sections, actual dollar amounts are presented in the text, while in the graphs dollar amounts have been rounded to the nearest $1,000 to facilitate presentation.

STUDENT SUCCESS

The most fruitful area for study is learning productivity of the curriculum. Although there are many measures that should be used in a quest for quality such as value added, portfolio analysis, and student success after college, for the purposes of our financial models we have focused on several easily quantified measures including course passing rates and retention.

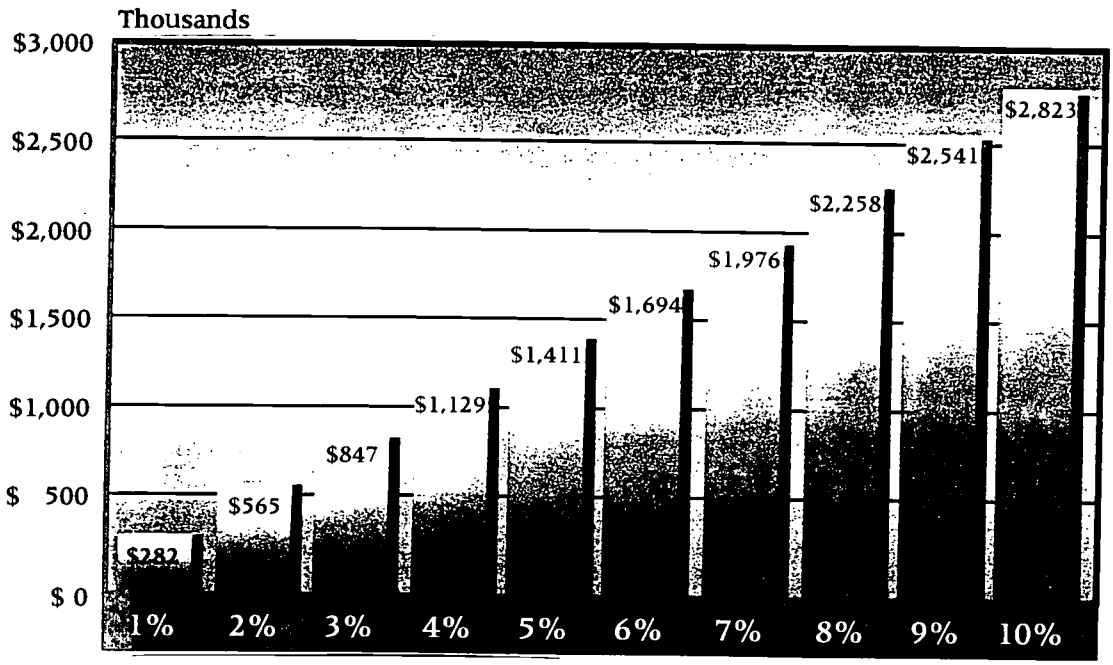
Among the research questions an institution might ask are:

1. What if the institution reduced its new freshman attrition rate?
2. What if the institution salvaged at-risk students?
3. What if the institution increased success of students in "killer courses"?
4. What if the institution reduced its failure rate in upper-division courses?
5. What if the institution reduced the number of students graduating with excessive hours?

By reducing freshman attrition rates, the university increases access, reduces the cost of education for families, and enhances the economic status of the citizenry. It also preserves the dreams of students to gain a college education and avoids the pain and disruption that students and their families experience from leaving college. We offer three models to illustrate ways of examining learning productivity and its impact on efficiency.

WHAT IF THE INSTITUTION REDUCED ITS FRESHMAN ATTRITION RATE? Most institutions lose sizeable numbers of new freshmen each year to attrition. Many have implemented new programs to improve student retention. Are these programs cost effective? An analysis designed to compare retention rates before and after implementing special retention efforts shows significant increases in revenue streams due to increased retention. If an institution that averages 1,600 new freshmen per year, actually increased retention as a result of the new programs by seven percentage points in a two-year period, the increases in tuition revenue for each cohort would be $1,976,000 over their academic career. After deducting $257,000 (the cost of administering the program) the actual monetary benefit exceeded $1.7 million per year. The chart below shows increased revenue for various increases in freshman retention rates at a university that averages 1,600 new freshmen per year with tuition and fees around $3,000 per year (based on Noel-Levitz retention savings model).

TABLE 1: REVENUE FROM INCREASED FRESHMAN RETENTION
TYPICAL REVENUE SAVINGS FOR PERCENTAGE POINT INCREASES



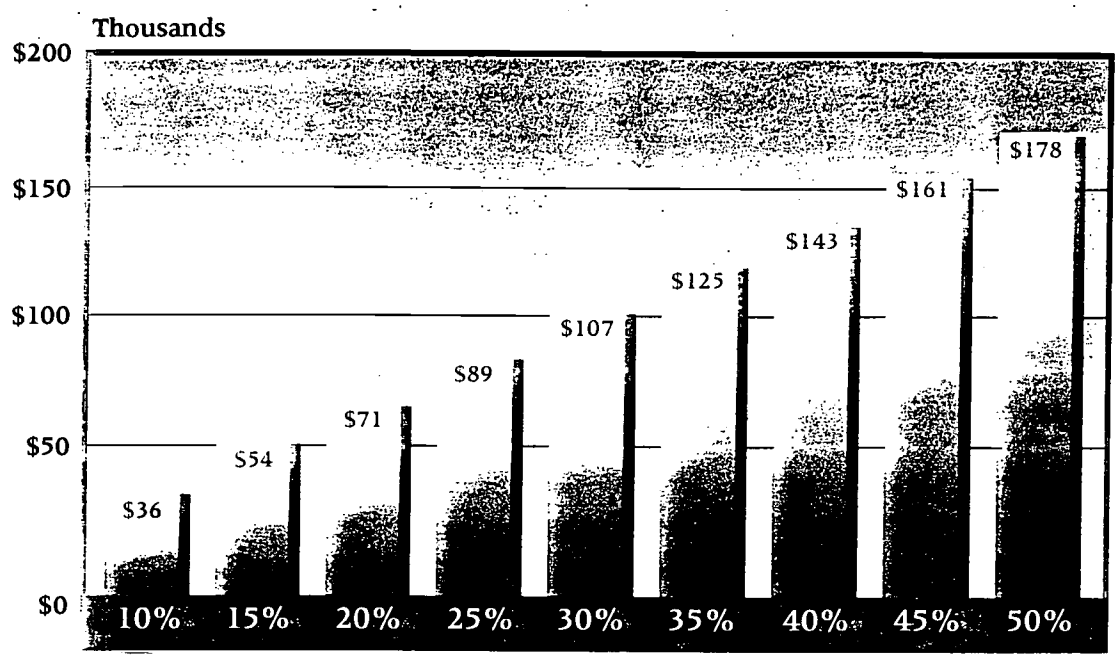
Additional savings would be realized in reduced recruitment costs.

TRADE-OFFS: To increase retention requires concentrated efforts designed to address both academic and social problems that students bring to campus. These efforts are

expensive and require reallocation of resources. As shown above, when effective, they result in additional revenue streams as well as apparent satisfaction with the quality of education. If not effective, they may draw needed resources from other academic programs.

WHAT IF THE INSTITUTION INCREASED SUCCESS OF STUDENTS IN "KILLER" INTRODUCTORY COURSES? Every institution has some required introductory courses that have high withdrawal and failure rates. Typically these include mathematics, chemistry, biology, and computer science. Students who withdraw or fail must retake those courses or take similar courses to meet requirements, necessitating expenditure of additional resources. An analysis of five such courses for one semester at a mid-sized campus identified a direct instructional cost for non-success in those five courses of $360,000 per semester. Efforts to reduce failure or withdrawal rates in those courses promise significant savings as shown in the graph below:

TABLE 2: PROJECTED REDUCTIONS IN NON-SUCCESS FOR FIVE COURSES
AMOUNT OF SAVINGS WITH VARIOUS PERCENT REDUCTIONS



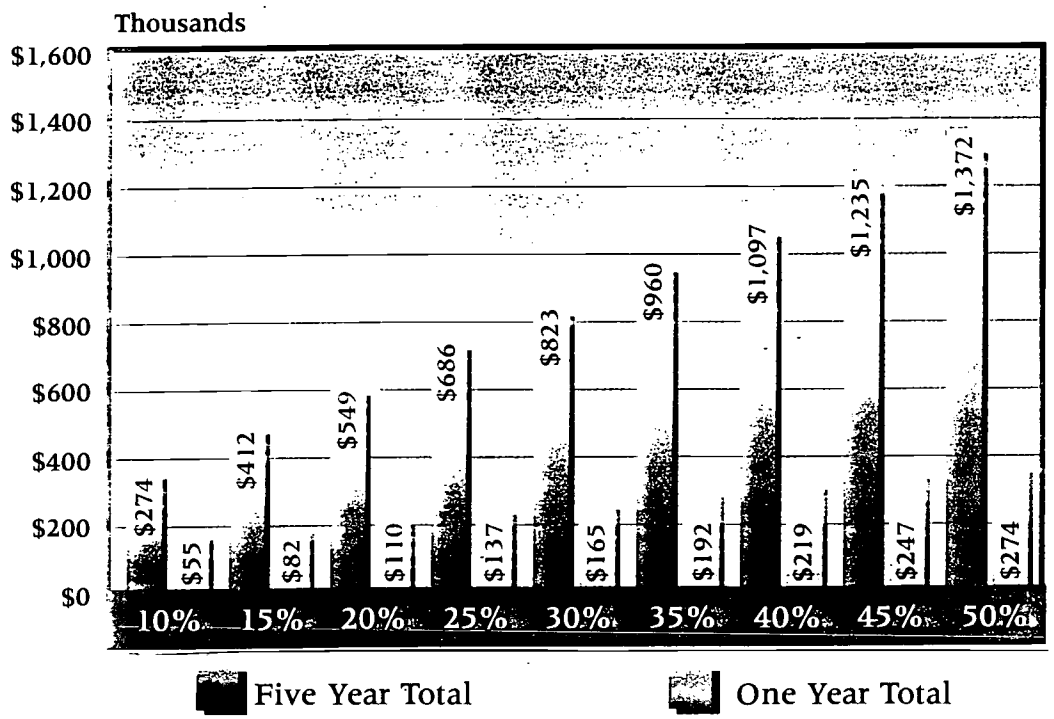
Savings represent dollar amounts saved per semester.

TRADE-OFFS: Any course failure adds costs for additional sections when students repeat the course. If the student pays tuition, that partially offsets the cost, but if

students retake the course as part of the full tuition, there is no added revenue. Tutoring programs, supplemental instruction, self-paced computer programs, and support services for students are just a few of the interventions that have proven successful. The associated costs reduce the actual savings. To reduce non-success without lowering standards requires additional training costs for faculty and a change in the culture to make faculty share responsibility for student success and failure: no more "I taught a great course, even if no one learned anything."

WHAT IF THE INSTITUTION IMPROVED SUCCESS IN UPPER-DIVISION COURSES? Although not as visible as other costly failures, prerequisite courses don't always adequately prepare students for more advanced work. Some students who earn high grades in the prerequisite are unable to succeed in the upper division target courses for which those lower-division courses were designed to prepare them. They then must retake the course to earn a degree. Tracking for five years those students who earned an A or B in prerequisite courses at a comprehensive institution revealed that non-success in upper-division

TABLE 3: PROJECTED REDUCTIONS IN UPPER-DIVISION FAILURE RATES
AMOUNT OF SAVINGS WITH VARIOUS PERCENT REDUCTIONS



Savings represent dollar amounts for one and five years.

courses resulted in excess instruction costs of $2,743,395, or an average of $548,679 per fiscal year. Strengthening prerequisites to more adequately prepare students could result in savings as seen in Table 3.

TRADE-OFFS: Just as in the previous example, there are similar trade-offs. To reduce non-success in upper division courses requires faculty development, curriculum redesign, and student support services for both upper division and prerequisite courses. The costs associated with these activities reduce the actual savings.

CURRICULUM MANAGEMENT

Curricular coherence has long been identified as a crucial element for educational quality (AAC 1985). Lack of coherent planning and management also has serious implications for instructional costs. Among the questions a campus might ask are the following:

1. What if the institution reduced the number of underenrolled course sections?
2. What if the institution reduced the number of discretionary courses offered?
3. What if the institution reduced the frequency of elective course offerings?
4. What if the institution created a 'three-semester schedule' to facilitate continuous progress and reduced costs for summer school?
5. What if the institution redesigned some majors to be interdisciplinary in order to reduce underenrolled major courses?

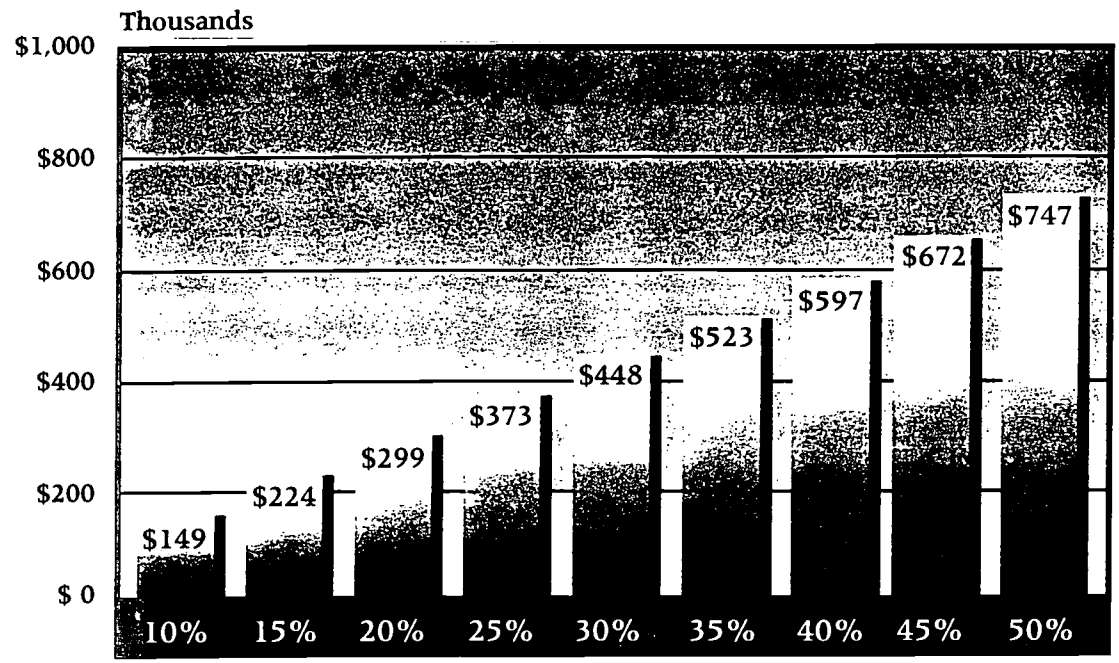
In addition to the funds that can be identified to invest in quality by examining the management of the curriculum, doing so can also provide advantages for students. Streamlining the curriculum can preserve sufficient flexibility in scheduling yet eliminate unnecessary duplication and course proliferation. A richer, more dynamic curriculum can be created through reinvesting saved resources in more experiential learning, capstone courses, lower class sizes, and more individualized instruction. Further, saved resources can buy equipment, renovate learning spaces, and provide development funds for both faculty and students.

Two examples will be presented here to illustrate how these questions might be answered on a typical campus to better match capacity to student demand.

WHAT IF THE INSTITUTION REDUCED THE NUMBER OF UNDERENROLLED COURSE SECTIONS? Courses that serve fewer than ten students are often deemed to be 'underenrolled.' Any course with seats available enrolled at less than the limit set are also 'underenrolled.' When multiple sections of the same course are offered, several sections could be combined without exceeding the pedagogical limits established by faculty or curriculum committees. Using course enrollments in multiple-section courses at a large, land-grant institution for one academic year (summer terms excluded), an analysis might show that a few courses need more sections, some sections could be offered less often, and still other duplicate sections could be eliminated altogether. Assuming that 149 sections in a single year at an average cost of $10,025 per section did not need to be offered, the institution could save $1,493,725 per year in direct instructional expenditures. Beginning to reduce the excess capacity results in savings as follows:

TABLE 4: AMOUNT OF SAVINGS FROM REDUCING EXCESS CAPACITY IN COURSE OFFERINGS

PROJECTED SAVINGS WITH PERCENT REDUCTIONS IN UNDERENROLLED SECTIONS



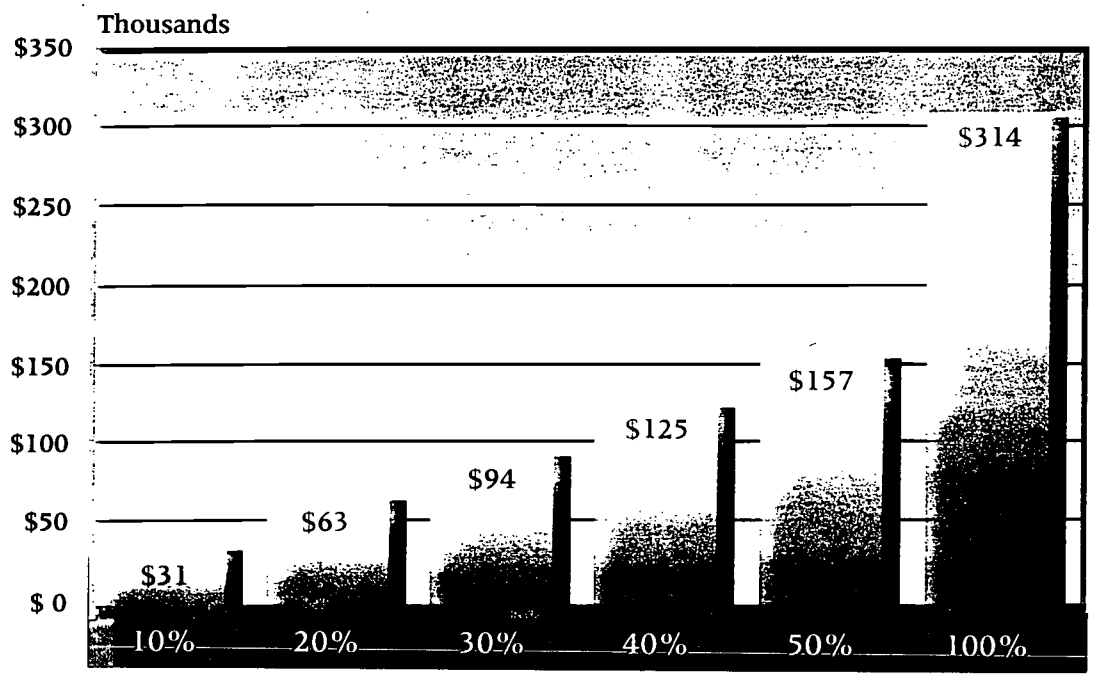
Savings represent dollar amounts over one academic year.

TRADE-OFFS: Although reducing the number of sections would provide less flexibility for scheduling among students, a class analysis would typically show that the

underenrolled sections were at less popular times (8:00 a.m.) or at times when another section of the same course is offered. In departments with large percentages of tenured faculty, reassignment of duties may be necessary to provide full workloads.

WHAT IF THE INSTITUTION REDUCED THE NUMBER OF DISCRETIONARY COURSES OFFERED? Discretionary courses are those that are not required for any program and do not serve as prerequisites for other courses. These courses are offered because of faculty interest or simply because they are still on the books long after the faculty who developed them are gone. They are a major reason why a list of course offerings often bears little resemblance to the degree requirements stated in catalog descriptions. If the curriculum at an institution with about 7,300 undergraduates were examined, focusing only on discretionary courses at the 300 and 400 level, a conservative estimate would reduce the number of these courses by ninety-two per year. Based on a full-time teaching load, this represents a savings of 11.5 FTE faculty. If we assume that the university

TABLE 5: SAVINGS FROM THE REDUCTION OF EXCESS DISCRETIONARY COURSES
DOLLAR SAVINGS BY REDUCING DISCRETIONARY COURSES BY VARIOUS PERCENTAGES



Savings based on need for fewer part-time faculty. Reduction of tenure-track positions would save more.

could hire 11.5 FTE fewer part-time faculty (by reassigning these resources to teach lower division courses), the total savings would be $313,594 per year (assuming an average pay of $27,269). The average pay for this example includes adjunct faculty, full-time temporary faculty, and other non-tenure track faculty. If a campus could not eliminate all of these courses, a percentage reduction would result in the savings as seen in Table 5.

TRADE-OFFS: Reducing the number of discretionary courses would provide some limits on flexibility in scheduling for students, but redirected savings, increased availability of core courses, and more efficient progress toward graduation would save resources.

INSTITUTIONAL PRODUCTIVITY

Among the key questions a campus will want to ask about overall institutional productivity are:

1. What if the institution brought disproportionately expensive programs into line with peer institutions?
2. What if the institution capped enrollment in its most expensive programs, perhaps by increasing selectivity?

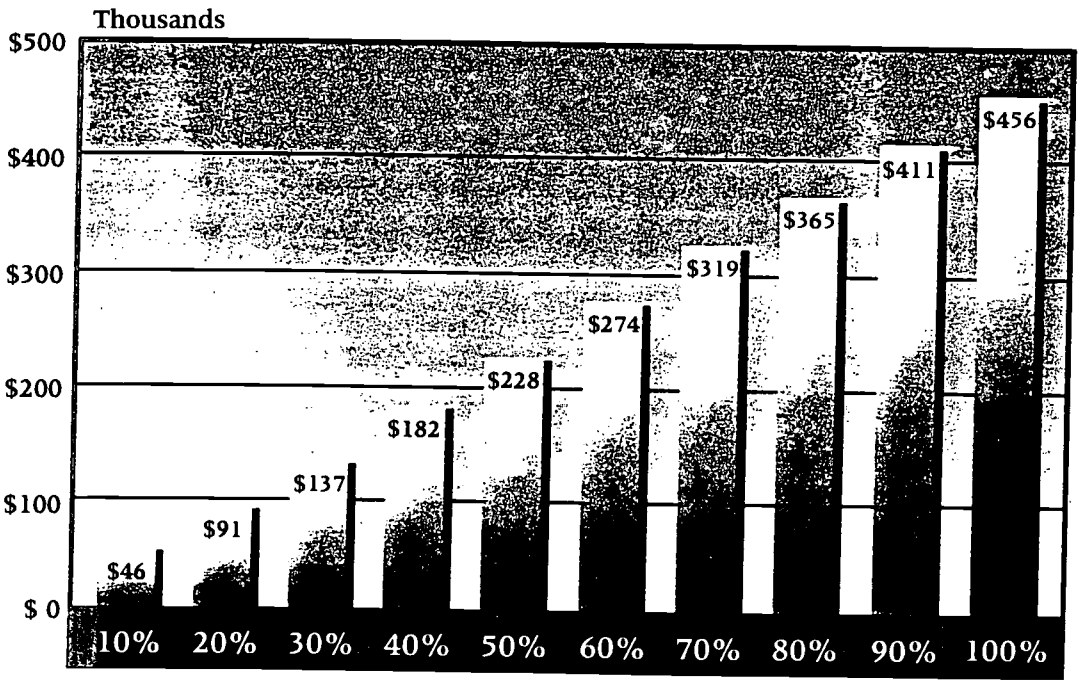
Benchmarking is a recent tool for determining effectiveness and efficiency. Campuses can compare their programs with other institutions with similar profiles, and they can also benchmark against their own productivity. The latter approach is particularly important when striving to produce greater results with the same resources. On most campuses, the cost of instruction is largely captured in the cost of faculty salaries. By examining one's own costs in comparison with peer institutions, a university might identify ways to adopt practices at other campuses to become more efficient in instructional delivery. We present two models to illustrate the types of analyses that might focus on overall institutional productivity.

WHAT IF THE INSTITUTION BROUGHT DISPROPORTIONATELY EXPENSIVE PROGRAMS INTO LINE WITH PEER INSTITUTIONS?

Institutional costs vary among programs at all institutions. For instance, the cost of teaching one student for one year at a mid-sized institution that happens to be one of the least expensive in its state can vary from less than $2,000 to more than $6,000. At all institutions, some programs are less costly per student than similar programs at peer institutions, while others are more costly. On a campus of more than 7,000 undergraduates, a benchmark analysis found four programs with

instructional costs that were at least 40 percent higher than similar programs at peer institutions. By reducing the costs to the benchmark average in those four programs, the campus could save about $456,000 per year. By bringing all programs on campus into line with benchmark averages, the campus could save even more. By making less drastic reductions to the cost of the four programs studied, the campus could still realize the following savings:

TABLE 6: SAVINGS FROM REDUCING INSTRUCTIONAL COSTS IN FOUR PROGRAMS
PERCENTAGE REDUCTIONS IN GAP WHEN COMPARED TO PEERS



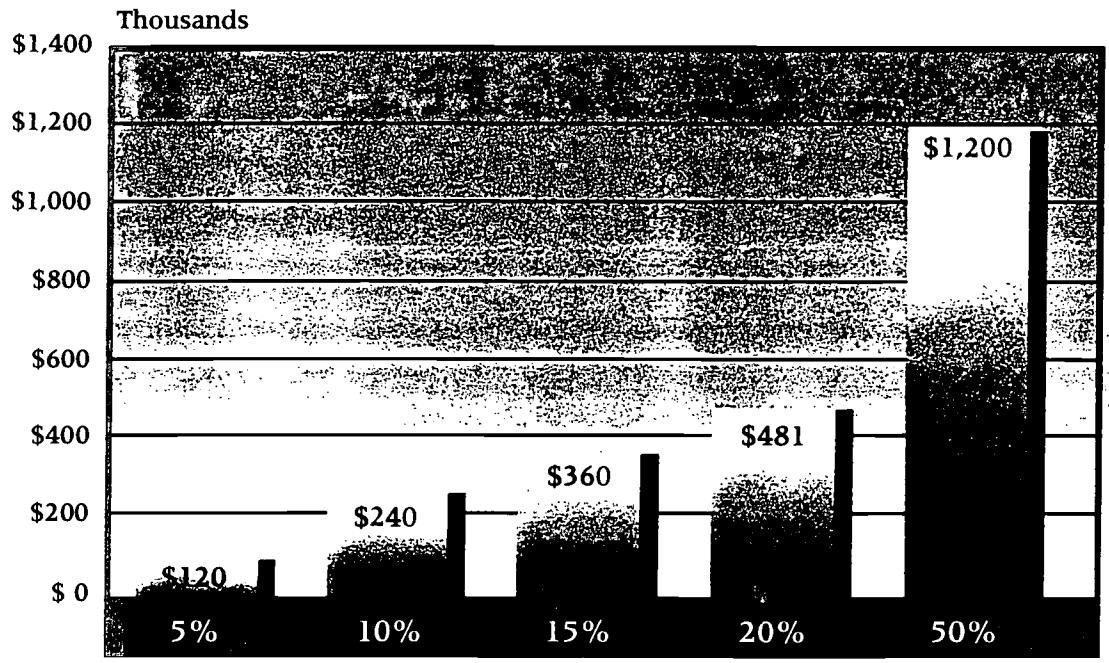
TRADE-OFFS: Reducing costs in expensive programs to benchmark averages could be accomplished by replacing retiring faculty with less costly new faculty, or relying more heavily on adjunct instruction or technology-based instruction. Actual savings would depend on the costs associated with these decisions. The costs associated with such decisions must also incorporate a consideration of the effectiveness of such instruction.

WHAT IF THE INSTITUTION CAPPED ENROLLMENT IN ITS MOST EXPENSIVE PROGRAMS? Most institutions have programs that are much more costly to provide than others on the same campus, such as performing arts, nursing, and laboratory sciences. Some program costs in direct instructional expen-

ditures alone exceed revenue taken in through tuition and fees. These programs are subsidized by others that are more cost effective in teaching students. For a recent academic year on a comprehensive campus of more than 8,000 students, fifteen undergraduate programs had per-student costs that exceeded tuition revenues. The total cost above tuition and fees for these programs for one year was $2,400,430. By gradually reducing enrollment by capping these programs, the following annual savings could be achieved:

TABLE 7: SAVINGS FROM CAPPING ENROLLMENT IN EXPENSIVE PROGRAMS

PERCENT REDUCTION IN HEADCOUNT ENROLLMENT OVER TIME



Annual savings once percent reduction is achieved.

TRADE-OFFS: Capping enrollment in any program may have effects on student and faculty morale in those programs as well as on enrollment. A balance must be achieved between allowing enough majors to continue to have a vibrant, productive program while recovering some resources to support other academic programs that may be more inclined to meet employer demand or other institutional priorities. Many expensive programs bring intangible benefits to the university, and reducing enrollment in those programs may cost the institution in ways not easily measured in revenues. For example, a highly respected nursing program or an arts program that provides cultural enrichment in the community may generate community respect and improved reputation.

FACULTY PRODUCTIVITY

Finally, we have noted earlier some of the difficulties of focusing primarily on decreasing faculty costs. Because salaries are the largest portion of the budget, it would be unrealistic to avoid an analysis of alternative use of lower-cost human resources. At the same time, there are many promising new ways to think about instruction that try to complement the labor-intensive faculty-student learning model. Thus, rather than increasing instructional faculty workload, campuses are seeking innovations that will enhance productivity without giving up the essential human interaction of the learning process. We present here two different approaches.

Among the research questions that can be asked about reducing labor costs are the following:

1. What if the institution reduced its reliance on full-time tenure-track faculty?
2. What if the institution increased average class size?
3. What if the institution optimized class sizes so that appropriate increases in some courses could subsidize appropriate reductions in other courses?

The examples of reduced labor costs based on substituting lower paid, temporary faculty or altering class sizes are relatively easy to construct and understand. By adjusting class sizes to match pedagogical needs, increased numbers of students in one class can provide for fewer students in a more labor intensive class or free faculty to teach special courses such as capstone or seminar courses. Savings generated through reduced labor costs can be reinvested in faculty development.

Among the research questions that are focused on an alternative to faculty-only instruction are the following:

4. What if the institution invested in technology-mediated teaching and learning to enhance faculty productivity?
5. What if the institution increased the number of credit hours produced by guided study?
6. What if the institution gave credit by assessment for prior learning?

The examples based on technology and redesign of instruction are complex. One of the critical questions is whether the infrastructure investments should be counted in the instructional costs. Assuming only cost of labor is taken into considera-

tion, by reducing the amount of presentation time by faculty and substituting technology mediated instruction, funds are freed to invest in pedagogical improvements. Several campuses are experimenting with "studio courses" as an alternative to the traditional large lecture course and believe they are able to achieve high levels of learning at lower cost (Twigg 1999).

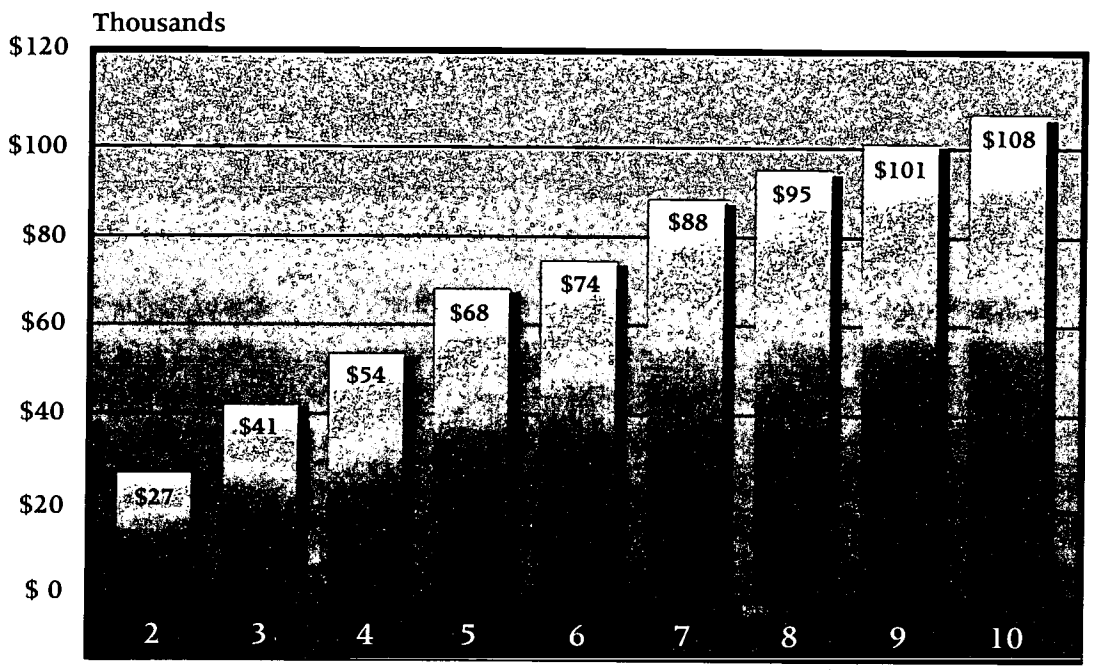
Two models illustrate this approach to increased efficiency through reducing labor costs.

WHAT IF THE INSTITUTION INCREASED AVERAGE CLASS SIZE?

Traditionally, faculty set class size limits. In most instances, these limits are set according to perceptions of pedagogical goals. One example of classes that are often limited are required freshman classes. A campus with about 1,000 entering freshmen will typically offer about fifty sections of this class per semester, with an average enrollment of twenty. The classes are taught by full-time faculty, graduate teaching assistants, or part-time faculty. If average class size were increased by five

TABLE 8: SAVINGS FROM INCREASING AVERAGE CLASS SIZE IN REQUIRED FRESHMAN CLASSES

EFFECT OF INCREASING CLASS BY X NUMBER OF STUDENTS



Increasing average class by 5 students would result in 25 students per class, while increasing by 10 students would result in average class size of 30.

students, a total of ten fewer sections could be offered at an average salary cost of $6,762 per section, for a semester savings of $67,620. Similar increases could be made in other disciplines perhaps without significant effects on effectiveness of instruction. Table 8 shows the savings.

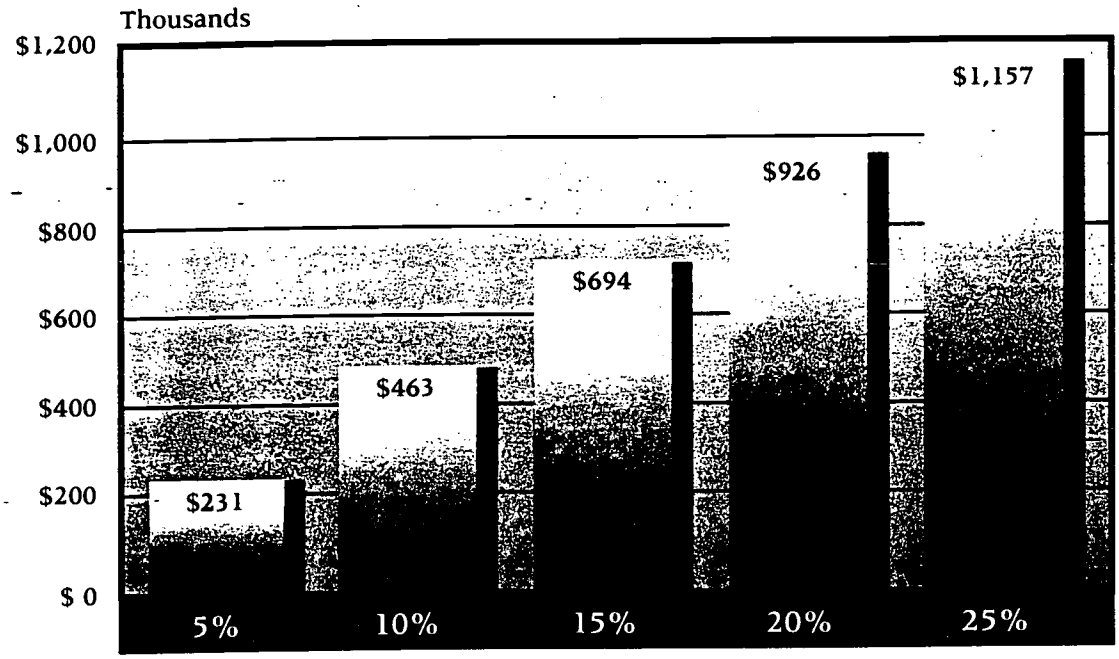
TRADE-OFFS: Faculty may well believe that increased class size, by definition, reduces the effectiveness of instruction. Increased use of technology, peer instruction, and other innovative delivery models may result in equally effective instruction at some moderate cost. Thus, the calculations of the reduction in instructional costs through increased class size must be offset by the cost of these support services. Faculty can rightly argue that the increased class size is an increase in workload for this labor-intensive course. Teaching five more students in an introductory general education class doesn't seem like much. Teaching 25 percent more does seem like a significant increase. For example, a set of papers that once took twelve hours to grade would take fifteen hours with the increased enrollment.

WHAT IF THE INSTITUTION INCREASED THE NUMBER OF CREDIT HOURS PRODUCED BY FULL-TIME FACULTY UTILIZING TECHNOLOGY? Some classes on college campuses lend themselves to increased productivity through technology. By using technology to deliver instruction, faculty can reach many more students. Web-based courses, courses offered through video conferencing, and other alternative delivery models can allow faculty to teach a course in one location and have students take the class at another location, thus, doubling or tripling the number of credit hours generated per class. This approach can generate more tuition as well as save faculty resources for other priorities. On a campus with 320 full-time, tenure-track faculty, the equivalent of eight FTE faculty can be saved if 10 percent of the faculty taught one such course per year, for an annual savings in full-time faculty salary of $462,752 (assuming an average total compensation package of $57,844). The following savings in Table 9 could occur by increasing the number of faculty who extend their classrooms via technology.

TRADE-OFFS: Costs of purchasing technology hardware and software, off-site room costs, and off-site personnel costs would reduce actual savings. Also lost are the benefits of traditional student-faculty interaction for those off-site. Increases in effectiveness might be attained by increasing access for site-bound students, allowing continuous progress toward the degree for others, and expanding course availability.

TABLE 9: SAVINGS FROM ENCOURAGING ADDITIONAL FACULTY TO USE TECHNOLOGY TO DELIVER COURSES

DOLLAR SAVINGS FROM VARIOUS PERCENTAGE INCREASES IN TECHNOLOGY USE



Savings assume a regularly scheduled course would reach the equivalent of two sections rather than one.

PART 4: STRATEGIES FOR IMPLEMENTING THE TOOLS

Although campuses may be committed to cost containment and be prepared to use these tools, they will find they are faced with many obstacles. Traditional attitudes about faculty autonomy, appropriate levels of decision making, budget allocation patterns, incentives for experimentation and more, cloud the ability to see how to both accomplish efficiency and invest in increased quality. The examples given throughout this monograph demonstrate that effectiveness and efficiency are not trade-offs and that it is possible to recover resources from the curriculum. More difficult to accomplish is a mindset for reallocation to achieve higher payoff activities. To be successful requires both an understanding of the inhibiting factors and the need for collaboration to achieve new approaches to academic management.

DISINCENTIVES AND INHIBITORS TO SEEKING EFFICIENCY AND EFFECTIVENESS IN THE CURRICULUM

Presentations of the models in this monograph to a variety of audiences have elicited questions, cautions, and new ideas. Among the variety of concerns identified by faculty and administrators are the following.

IF YOU SAVE MONEY, YOU WILL LOSE IT. Faculty are reluctant to let the chair know they could teach more students because they want some control over their workload. Department chairs fear letting a dean know they can reduce course offerings because they believe the funds will be shifted to another department and permanently reduce the richness of their offerings. Deans may regret creating a salary variance pool or reducing the number of adjuncts if they see the resources shifted to another college in the next round of adversarial budgeting. Altogether they believe that if academic affairs even hinted that more students could be served at less cost, the vice president for business affairs would sweep the budget and use the funds either for non-academic projects or projects of his or her choosing.

These attitudes and practices eliminate the freedom to be creative or consider alternative expenditures that might increase both efficiency and quality. To overcome these concerns and provide flexibility, initial alignment of resources with planning goals can give those with budget oversight confidence that resources are being responsibly managed. To provide more incentives, academic budgets can be established with the understanding that any savings from reallocations are initially

retained by the department or college. At intervals, reallocations can be reviewed to determine whether they match the institution's overall strategic goals and priorities.

CURRENT BUDGET PROCESSES MAKE IT DIFFICULT TO REALLOCATE. On many campuses, even simple budget adjustments require multiple signatures. To transfer personnel dollars to technology, for example, creates excessive justification at many levels. Some state regulations require explanations of any restructuring at the local level such that the fight for flexibility and permission makes one passive, believing it is much easier to keep on doing things the same old way. Past expectations of incremental budgeting or incremental reductions, as have been the case in many institutions, all but eliminate the opportunity to reconsider base allocations.

Those campuses that have decentralized and use responsibility-centered budgeting have more flexibility in rethinking the curriculum and learning productivity because of the autonomy that goes with this budget process. However, there is not always agreement on the funding formulas. Faculty in less entrepreneurial units perceive inequities, since some units have a greater capacity for revenue production, and, consequently, have more resources to invest in quality.

Careful analysis of academic capacity and workload standards can provide a basis for designing operating budgets at the start of the year that better match actual expenditure needs. Eliminating several layers of budget authorizations can also provide additional flexibility.

HOW RESOURCES ARE ALLOCATED CAN LEAD TO GOAL DISPLACEMENT. Unfortunately, if state appropriations are based on student credit-hour production, it makes no difference whether the student gets an A or an F. Public campuses that believe they can provide the courses at less than the tuition and subsidy allotted would lose revenues if all students were successful. Thus, there is little financial incentive to having every student pass, to reduce repeating courses, or to reduce the number of extra credits earned for graduation.

Academic leaders should be concerned about student debt and waste of tuition dollars and make them not only the student's problem but also the institution's problem. Indeed, many would argue that institutions face an ethical issue when they accept tuition revenues and state allocations that do not result in significant levels of student success.

FACULTY RESIST CHANGE AND RESIST ACTIONS THAT APPEAR TO INCREASE WORKLOAD. Faculty perceptions about how much they should teach, how hard they are working, and what extra activities they should engage in create an atmosphere with high potential for resistance to cost cutting through innovation. Faculty also have a deep commitment to autonomy when it comes to the curriculum and believe they should decide what should be taught, how often, and in what ways. In reality, a change in enrollment may be imperceptible in the classroom, yet represent "work speed up" to many faculty.

Academic leaders should be thoughtful about faculty time when they recommend introducing applications of technology, supplemental instruction, or new pedagogies to increase learning, or risk getting the faculty query: "Will I get paid for this?" or "What do you want me to stop doing?" Engaging faculty in an analysis of the potential benefits of their investment of time may well be persuasive when there is no extra money available.

THE LOCUS OF CONTROL AND BASIS FOR DECISION MAKING ABOUT CURRICULUM ARE UNCLEAR. Although departments have had the major responsibility for scheduling classes, designing curricula, evaluating pedagogy, and constructing majors, few faculty have had access to the information, such as course-taking patterns, that would provide a context for such decision making. Consequently, they inevitably respond negatively when the dean's office makes broad assumptions about efficiency and demands cancellation of underenrolled classes without regard to purpose or size of other courses. Similarly, state mandates to cut low productivity majors are met with resistance when they are based solely on numbers.

Additional data and consultation would allow for greater understanding by faculty and better decision making. Equally important would be the introduction of principles that would allow a large course to subsidize a small course or one faculty member's productivity to offset another's. Many campuses are effectively making the department rather than the individual the unit of analysis for productivity and seeking efficiencies at the macro rather than the micro level.

WE HAVE LITTLE EXPERIENCE IN CONSIDERING HOW INVESTMENT CAN INCREASE PRODUCTIVITY. Because institutions seldom model the full costs of the curriculum, it is easy to overlook how a freshman transition program which costs money can bring a return in increased

tuition dollars as student retention increases. Similarly, the way in which one instructional designer can increase the teaching/learning productivity of a dozen faculty also goes unaccounted for. Too often the investment takes place in one office and the impact is measured elsewhere. Thus, the total financial picture is not clear to the many decision makers who can create and initiate similar investments in learning.

With the tools in this monograph, demonstrating the return on increasing retention or reducing the number of failures should be persuasive evidence of how investment in learning can reduce costs. Equal care must be taken to account for decreases in tuition, for example, when students do not have to repeat courses in summer school.

FACULTY LACK EXPERIENCE IN CONSIDERING ALTERNATIVE USES OF FUNDS. Faculty, especially, do not think about trade-offs because traditionally they have had little responsibility for the budget and are not asked, "For your department, would you rather have another temporary faculty member, three graduate assistants, or a lab coordinator?" Considering alternatives is particularly difficult if the resources are spread across several units and not managed only in the department. For example, the department might have to consult the graduate college about financial aid to support graduate assistants, or consult with business affairs about increased technology support, or meet with the dean to determine whether these are funds for a temporary faculty member. Ideally, all units would consult together on the most effective use of limited resources.

Increased experience with collaborative leadership and decision making leads to shared consideration of how best to produce learning outcomes, as well as how to make choices that will increase institutional productivity. Thus, what cannot be accomplished by fragmented responsibility can be accomplished through cooperation. Giving budget and planning committees responsibility for more than just reviewing decisions or allocating faculty positions will create a knowledgeable group to guide broader decision making.

ESTABLISHING A COLLABORATIVE APPROACH TO ANALYSIS OF THE CURRICULUM

The analyses described in this monograph aim to demonstrate the multiple factors forming the production function of the curriculum and suggest that institutions can make choices about how to redirect resources to improve quality. Armed with both measures to assess learning and new approaches to understanding the direct and hidden costs of the curricu-

lum, campus leaders can respond to the effectiveness and efficiency imperative with more precision.

The responsibility for tracking, studying, and evaluating the curriculum and instructional process for improvement and efficiency, however, is a shared one. The task cannot be done from a single perspective nor without collaboration among academic affairs administrators, business officers, faculty, institutional researchers, department chairs, registrars, and many others.

If history is any guide, colleges and universities will continue to be faced with limited resources and forced to balance competing interests. Faculty leaders will be concerned about faculty workload, the integrity of the major, and support for innovation. Deans will focus on the overall set of programs in their college, total enrollments, new program opportunities, and the college share of institutional resources including tenure-track lines. The vice president for academic affairs will watch enrollment trends, tuition revenues, competitiveness of faculty salaries, and the reputation of the academic programs. The vice president for business affairs will monitor spending patterns, overall efficiency, and opportunities to reallocate resources. The president and the board, without direct knowledge of the daily activities affecting instruction and academic programs, will scan the external environment, review macro measures of institutional reputation and financial integrity, and urge continuous realignment of resources with institutional priorities.

If the actors maintain separate, individual perspectives and knowledge bases, they cannot work together to assure the best use of resources. If they all agree that the primary focus must be on student learning, then together they can meet the challenge of quality and cost. Choosing strategies and implementing changes to create a more productive curriculum requires harmonizing these competing interests, developing a sense of collective

ASSUMPTIONS TO GUIDE DEVELOPMENT AND USE OF PRODUCTIVITY TOOLS

- Academic practice must focus on both effectiveness and efficiency
- A systematic, rational approach must guide the change process
- Faculty involvement and support is essential to reshape the academic enterprise
- Cost containment need not harm instruction and student learning
- Real transformation of the curriculum requires a long-term perspective

responsibility for the institution, and creating an overall vision of what a quality academic experience is. Only then can resources be linked to learning outcomes in more powerful ways. The tools described in this monograph, therefore, are of greatest value when applied with the understanding that shared information, open discussion, collective will, and collaboration among all constituencies is required if analysis and planning is to bring optimal results.

A FINAL NOTE OF CAUTION

To some extent, to make recommendations to contain or cut costs and to describe tools for getting the curriculum under control is fraught with danger: danger that wary faculty members will claim it is one more attack on their autonomy and an inappropriate application of a "business mentality"; danger that weary administrators will resist taking control, believing trust for their leadership is already too fragile; and danger that boards and presidents far removed from the academic enterprise will consider this a quick fix. Thus, we add a word of caution and a call for a realistic assessment of our shared dilemma.

All members of higher education institutions share the responsibility for seeking solutions to the demand for high quality education, the challenge of limited funding, the prospect of serving more students at less cost, and the need to respond to both serious interinstitutional competition and the new competition from organizations outside traditional colleges and universities that are entering into the learning business. The tools in this monograph aim to create a productive conversation on a campus so that faculty can focus on adapting their current strategies and curriculum structures to improve learning, and administrators can shape a culture of quality and accountability. With some adaptation, the tools can also address the larger questions of new forms and structures for delivering education.

The analytic approaches in themselves do not determine exactly where to cut costs or how to improve quality. Rather, they are meant to show how to collect, analyze, and report data to relevant decision makers. Taken in context, the analyses can suggest where there is a problem, the impact that a curricular or instructional change can make, and the means of improving results while reducing costs. The tools assume the need to establish clear learning goals, to encourage careful assessment of learning through a variety of means, and to monitor the extent to which the curriculum matches the mission and vision of the institution. At the same time, the tools encourage a bolder commitment to real academic restructur-

ing through conscientious research and consideration of alternative ways to use resources to achieve educational goals.

In an environment of data, dialogue, and mutual responsibility, the incentives for change and the locus for restructuring need not challenge faculty autonomy, for they can be focused at the faculty and program level, as appropriate. Similarly, administrators need not stay isolated from individual decision making if they fully understand the relationship between resources, structures, and outcomes. From this collaboration will come the redesign of curriculum and reallocation of resources essential for long term restructuring and the strengthening of American higher education.

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APPENDIX A

Data Sources Required to Analyze Academic Productivity

To conduct curricular analyses requires familiarity with data sources and the skills to link and manipulate data to produce meaningful reports. All public campuses and many private ones routinely report data to federal agencies, provide information for college guidebooks, produce internal reports for decision making and accountability, maintain student and faculty databases, participate in national studies, and conduct internal studies. These routine procedures, often designed for specific purposes, can be adapted to provide the data resources needed to examine the effectiveness and efficiency of the curriculum.

It is impossible for a monograph of this scope to describe all of the data sources available to decision makers on campuses. However, those described will provide much of the data needed to begin the process of examining the efficiency of the curriculum. Offices of institutional research, working with budget directors and assessment coordinators, should be able to provide these data or access them on any campus. Administrators will need to rely on those who either have or can create the data necessary to apply the tools of analysis to a given institution.

Student Level Data. All institutions maintain databases in registrar's offices and admissions offices for course completion, graduation, and grading purposes. These record bases provide easy access to analytical files for examining efficiency. The director of institutional research, with the help of systems analysts, can extract flat files for use in SPSS, SAS, dBase, Excel, Access, or any of several other analytical programs. Identification numbers must be included on each extract file so that the files can be merged and information in each can be arrayed in a combined analytical file.

Once this "tracking data" file is completed, analysts can compare data from individual student records, course files, grade files, graduation files, financial aid files, admissions files, and any other information collected about students by the institution. To complete the package, survey data such as the College Student Inventory or other national surveys, as well as in-house surveys can be linked to student record data. By updating the file each term, the analysts will have developed a database that allows them to track student movement through programs, as well as to examine course, program, and university-level variables such as persistence, active status, and major changes.

Another important source of data at the student level is grading studies that monitor grades, and withdrawal and failure rates in each course taught. These reports also serve as valuable tools in examining enrollment patterns and frequency of offerings. Since these studies are built on student identifiable data, the same files created to produce these reports can be combined with the student tracking database to examine student level progress through the curriculum.

FACULTY DATA. Faculty data are available from a variety of sources on most campuses. Personnel directors maintain hiring records, salary information, and rank and tenure status in files that are easily extracted. Public institutions report faculty numbers and salary information annually in the Integrated Postsecondary Education Data System (IPEDS) reports. From all the reports that the National Center for Education Statistics (NCES) collects from every public institution in the country, they create the IPEDS data file that can be retrieved and analyzed by participating institutions. It serves as a primary resource for benchmarking studies. These reports are available in hard copy and electronically. Budget directors can provide data on salary, supplemental pay, cost of summer school and extended campus teaching, and so forth. Deans and department chairs can provide data on release time and workload. Course files from the registrar's office can be used to compute credit hour production and other indicators of efficiency. Data from these diverse sources must be identified and combined into an analytical tracking file that allows analysts to examine faculty level variables across time and link those variables to student and program level variables.

INSTITUTIONAL DATA. Most campuses must report aggregate data on indicators of institutional effectiveness such as graduation rates to a variety of sources like state councils and governing boards. These reports require the development of analytical files that can also be used to examine curricular efficiency. Retention of students by degree program, attrition of students, migration of students within the institution to different majors, and success in linked courses are just a few of the kinds of studies that can reveal inefficiencies in the curriculum. A valuable tool for estimating the cost of students lost through attrition is available from Noel-Levitz and can easily be applied to any campus.

Many of the analyses also draw upon collected information available at all campuses not normally thought of as institutional research data. For example, college catalogs and class schedules describe course offerings and sequences. Student transcripts provide a basis for examining a host of issues related to success, credit hours

for graduation, and efficiency of movement through the curriculum. A simple template can be developed by institutional research offices to allow electronic analysis of transcripts.

COMPARATIVE DATA. Most campuses participate in a variety of regional and national studies that can provide comparative data. Indeed, some have relationships with other campuses sufficient for the development of shared databases to allow for tracking of students between institutions. This can be particularly important if institutions share students across their academic careers. Michael Middaugh's (1997) pioneering work on productivity developed techniques for looking at unit costs of instruction as a guide for internal reallocations of resources among departments on a single campus. His expanded studies include enough institutions to create benchmarks for interinstitutional comparisons on such indicators as student credit hours/FTE faculty, FTE students taught /FTE faculty, direct instructional cost/FTE students taught, and direct instructional costs/student credit hour. Such baseline information allows an institution to calculate its efficiency compared to what other institutions are investing in similar programs.

APPENDIX B

Website Data Sources and Information

Campuses clearly have more data than they may be currently using for analyses of effectiveness and efficiency. The data only become useful when guided by research questions. To some extent, to maximize usefulness, campuses will want to link their studies of the curriculum with other continuous improvement processes including planning and budget. Consequently, the variety of electronic resources will be useful. Some of the useful sites are listed below with the caution that they are often updated and thus, the URL can change. Using the title of the organization or website to search will easily locate the site when URLs change.

Academe Today	www.chronicle.merit.edu
Academy for Educational Development	www.aed.org
Accrediting Agencies	www.airweb.org/links/accred.html
ACT, Inc.	www.act.org
American Association for Higher Education	www.aahe.org
American Association of State Colleges and Universities	www.aascu.nche.edu
American Association of University Professors	www.aaup.org
American College Personnel Association	www.acpa.nche.edu
American Council on Education	www.acenet.edu
American Educational Research Association	www.aera.net
Assessment	www.airweb.org/links/assess.html
Association for the Study of Higher Education	www.coe.missouri.edu/~ashe
Association of American Colleges and Universities	www.aacu-edu.org
Association of Institutional Research	www.mailer.fsu.edu

Census Data	www.airweb.org/links/census.html
Chronicle of Higher Education	www.chronicle.com
College and University Personnel Association	www.cupa.org
College Board	www.collegeboard.org
College Rankings	www.airweb.org/links/rankings.html
Common Data Set	www.airweb.org/links/cds.html
Data Warehousing	www.airweb.org/links/datawarehouse.html
Environmental Scanning	www.airweb.org/links/scanning.html
Grapevine (Tax Support for Higher Education)	www.coe.ilstu.edu/grapevine
Higher Education Resources	www.airweb.org/links/hed.html
Internet Resources for Institutional Research	www.apollo.gmu.edu/~jmilam/air95.html
Literature Searches	www.airweb.org/links/eric.html
National Association of College and University Business Officers	www.nacubo.org
National Collegiate Athletic Association	www.ncaa.org
National Council of University Research Administrators	www.ncura.edu
National Education Association	www.nea.org/he
Peer Comparisons	www.airweb.org/links/peers.html
Performance Indicators	www.airweb.org/links/indicators.html
Peterson's Education Center	www.petersons.com
Society for College and University Planning	www.scup.org
Southern Regional Education Board	www.sreb.org
State Council of Higher Education for Virginia	www.schev.edu
U. S. Department of Education	www.ed.gov

AAC&U is the leading national association devoted to advancing and strengthening liberal learning for all students, regardless of academic specialization or intended career. Since its founding in 1915, AAC&U's membership has grown to over 700 accredited public and private colleges and universities of every type and size.

AAC&U functions as a catalyst and facilitator, forging links among presidents, administrators, and faculty members who are engaged in institutional and curricular planning. Its mission is to reinforce the collective commitment to liberal education at both the national and local level and to help individual institutions keep the quality of student learning at the core of their work as they evolve to meet new economic and social challenges.

Association of American Colleges and Universities

"Ann Ferren and Rick Slavings have developed new and exciting ways to identify the resources needed to fund academic quality improvements. Their efforts provide workable solutions for any situation in which the administration and faculty are willing to break away from the status quo."

—Larry Goldstein, Senior Vice President and Treasurer,
National Association of College and University Business Officers (NACUBO)

"Ann Ferren and Rick Slavings combine plain good sense with a genuine sensitivity to both the nuances of curriculum and the organizational realities of academic management. They pose the question that many outside the academy insistently ask: Why can't we have both quality and efficiency? Their answer is, We can. But doing so requires full understanding of what drives instructional costs and conceptual clarity about the academic factors of production. The tools and strategies they present in this monograph apply to colleges and universities of every kind and can be used by administrators at levels ranging from individual departments to entire institutions. All that's required is an innate aptitude for inquiry—hopefully retained by any scholar-turned-administrator—and the willingness to look reality in the face."

—Peter Ewell,
National Center for Higher Education Management Systems (NCHEMS)

"Ferren and Slavings challenge deans, provosts, and VPAAs to tackle the central issue in academic finance: Is my college or university spending its funds in ways that best enhance the academic success of students? This monograph will help administrators critically examine their curricula and use of faculty—in order to allocate inherently scarce resources most effectively in support of teaching and learning."

—Philip A. Glotzbach,
Vice President for Academic Affairs, University of Redlands
and Chair of the American Conference of Academic Deans

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

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